

**Syllabus of Written Test for the post of
Inspector of Motor Vehicles, Class-II, Advt. No. 12 /2012-13
for the subject of Mechanical Engineering (Paper -1)**

Total Questions: 240
Total Marks: 200

Duration: 120 Minutes
Medium: English

1. THEORY OF MACHINES :

Balancing of single and multi-cylinder engines, Linear vibration analysis of mechanical systems, Spring-Mass-Dashpot system subject to axial load, Electrical analogy (single degree and two degrees of freedom). Automatic Controls, Hydrodynamic bearings, anti-friction bearings, computer aided design.

2. MECHANICS OF SOLIDS :

Stress-strain relations, uni axial loading, stress/strain tensor applied to a body subject to loads, thermal stress. Beams: bending moment and shear force diagram, bending stresses and deflection of beams, shear stress distribution, Torsion of shaft, helical springs, combined stresses, Design of couplings, fly wheels, leaf springs, thick and thin walled pressure vessels, strain energy concepts and theories of failure.

3. ENGINEERING MATERIALS :

Basic concepts of structure of solids, Crystalline materials, Defects in Crystalline material, Alloys and binary phases diagrams, structural properties of common engineering materials, Heat treatment of steel, plastics, ceramics composite materials , common applications of various materials.

4. MANUFACTURING SCIENCE :

Merchant force analysis, Taylor's tool life equation, machine ability and machine economics, Rigid small and flexible automation , NC, CNC. Recent machining methods- EDM, ECM and ultrasonic. Application of lasers and plasmas, analysis of forming processes. High energy rate forming jigs, fixtures, tools and gauges. Inspection of length, position , profile and surface finish , computer aided manufacturing.

5. MANUFACTURING MANAGEMENT :

Production planning and control, forecasting-moving average, exponential smoothing, Operation Scheduling, assembly line balancing, product development, Break even analysis, Capacity planning PERT and CPM.

Control Operations : inventory control, ABC analysis, EOQ models, material requirement planning, job design, job standards, work measurement, quality management, quality analysis and control.

Statistical quality control operation research: linear programming, Graphical and simplex method. Transportation and assignment model, Single server queuing model.

6. ELEMENTS OF COMPUTATION :

Computer Organization, flow charting, features of common computer languages C & C++

7. THERMODYNAMICS :

Basic concepts , open and closed systems. Application of thermodynamic laws, gas equations.

8. IC ENGINES, FUELS AND COMBUSTION :

Spark Ignition and compression ignition engines. Four stroke and two stroke engines. Mechanical, thermal and volumetric efficiency . Heat balance, Combustion process in SI and CI engine, Pre ignition, detonation in SI engines. Diesel knock in CI engines. Choice of engine fuels octane and cetane rating. Alternate fuels, carburetion and fuel injection. Engine emission and control . solid, liquid and gaseous fuels, stoichiometric air requirement and excess air factor, fuel gas analysis, higher and lower calorific values and their measurements.

9. HEAT TRANSFER, REFRIGERATION AND AIR CONDITIONING :

One and two dimensional heat conduction, Heat transfer from extended surfaces, heat transfer by forced and free convection Heat exchangers. Fundamentals of diffusive and convective mass transfer. Radiation laws, heat exchange between black and non-black surfaces, Network analysis, Heat pump refrigeration cycles and systems, condensers, evaporators and expansion devices and controls. Properties and choice of refrigerant. Cooling load calculation, solar refrigeration

10. TURBO MACHINES AND POWER PLANTS :

Continuity , momentum and energy equations, adiabatic and isentropic flow, Fanno lines, Rayleigh lines. Theory and design of axial flow turbines and compressors. Flow through turbo machine blade, cascades, centrifugal compressor . Dimensional analysis and modeling. Selection of site for steam , hydro nuclear and stand-by power plants, selection base and peak load power plants. Modern high pressure High duty boilers, Draft and dust removal equipment. Fuel and cooling water systems. Heat balance, station and plant heat rates, operation and maintenance of various power plants, preventive maintenance, economics of power generation . Energy scenario of Gujarat and India.

Syllabus of Written Test for the post of
Inspector of Motor Vehicles, Class-II, Advt. No. 12 /2012-13
for the subject of Automobile Engineering (Paper -1)

Total Questions: 240
Total Marks: 200

Duration: 120 Minutes
Medium: English

- 1. FUNDAMENTALS OF MECHANICAL ENGINEERING :**
Explanations of different Standards, i.e. Primary Standard, Secondary Standard Tertiary Standard with examples,
SYSTEMS : Open System, Close System, Isolated System.
- 2. DYNAMICS :**
Time study and motion study, Explanations of work, Power, Energy.
- 3. CONVENTIONAL MANUFACTURING PROCESS :**
Turning, Welding, Shaping, Molding, Foundry Technology, Drilling etc.
- 4. THERMODYNAMICS :**
Laws of Thermodynamics, First law, Second law, Zeroeth law, Statement and Explanation. Gas Law: Boyle's law, Charles' law, Perfect gas equation
Thermodynamic cycles: Rankine cycle, Otto cycle, Diesel cycle, Dual cycle, Brayton cycle, etc. Explanation
- 5. ELECTRICAL MACHINES AND ELECTRONICS :**
Generating equipments, D.C. Motor, Three phase Induction motor, Single Phase Induction motor, Alternator, Transformer
Supply System : A.C. Power supply system, D.C. power supply system ,
Comparison of A.C. and D.C. Transmission system, Diode Transistor and OPAMP Circuit
Logic gates and Boolean algebra, Introduction to 8085 Micro Processor.
- 6. KINEMATICS AND DYNAMICS OF MACHINE :**
Simple mechanism, kinematics and their classifications, link mechanism.
Inversion: Four bar chain mechanism , Flexible power transmission system,
Geometrical configuration , Gyroscope, cam profile, sound and vibrations and mechanical system
Balancing: Dynamic balancing, rotor balancing, etc.
- 7. VEHICLE DYNAMICS :**
Understanding of vehicle dynamics, Dynamics load in moving vehicle, Tyres, Acceleration performance of vehicle, Braking System , Suspension system, steering system, road loads, and ride.

8. TWO AND THREE WHEEL TECHNOLOGY EXTENDED TO FOUR WHEEL TECHNOLOGY

9. TRANSMISSION SYSTEM :

Various drives, Selection of Transmission system.

10. GEAR STUDY AND DESIGN OF DIFFERENT TYPES OF GEARS. STUDY OF GEAR TRAIN

11. FRAME AND BODY OF THE VEHICLE

12. ELECTRICAL SYSTEM AND INSTRUMENTATIONS :

Battery ignition system and Magneto ignition system, specification of Battery, Lightings of vehicle, Study and calibration of different instruments used in vehicle for measuring speed, temperature, torque etc.

13. ADVANCE MECHANICAL MEASUREMENTS :

Tolerances, gauging, Straightness and flatness measurement, surface finish, measurement of pressure, vacuum, angular speed, flow, etc.

14. AUTOMOTIVE SYSTEM DESIGN :

Design of clutch system, Design of propeller shaft, Axle design, Design of braking system , suspension system, steering system, Vehicle performance testing and validation of design.

15. AUTOMOBILE AIR CONDITIONING :

Study of different types of air conditioning system, Study of different types of refrigerants, Study of psychometric chart, thermal load calculation and analysis, air circuit. Control of temperature, humidity and quality of air, Maintenance of air conditioning system

16. ALTERNATE FUELS AND ENGINE :

Needs of alternate fuels study and combustion of different alternate fuels like, LPG, CNG, LNG, Alcohol, hydrogen etc.

17. GARAGE PRACTICE

18. TRANSPORT MANAGEMENT AND LAWS, TOTAL QUALITY MANAGEMENT(TQM)

19. HEAT TRANSFER :

Study of Radiator system, Heat transfer by Conduction Convection and Radiation. Study of Different Types of Heat Exchangers.

20. TRIBOLOGY :

i.e., Lubrication system in Automobiles, different types of Lubricants

**SYLLABUS OF WRITTEN TEST FOR THE POST OF
INSPECTOR OF MOTOR VEHICLES, CLASS-II
ADVT. NO.12/12-13 (PAPER-2)**

Total Duration: 60 Minutes

❖ **PART-A (ENGLISH)**

Total Questions : 50

Total Marks : 50

1. (A) Tenses , Concord- Participles, Gerund
(B) Common Errors- on miscellaneous items
2. Usage:
Articles, Prepositions, Adjective, Adverb, Conjunction, Question tag
3. Usage:
Some, many, any, little, a little, few, a few, since, for, modal
Auxiliaries(can, may, have to, ought to, must, should, would), Voice,
Degree
4. Verbal Skills :
(A) Vocabulary
(B) Idioms Phrases
(C) Spellings
(D) Homonyms, Autonyms, Synonyms, One word substitute, Words confused
OR
(D) Comprehension

❖ **PART-B (GUJARATI)**

Total Questions : 50

Total Marks : 50

1. ગદ્યાર્થગ્રહણ (Comprehension)
2. કહેવતો (Proverbs)
3. રૂઢિપ્રયોગો (Idioms)
4. સમાનાર્થી શબ્દો (synonyms)
5. વિરુદ્ધાર્થી શબ્દો (Opposite words/Antonyms)
6. જોડણી (Spelling)
7. અલંકાર (Figure of speech)
8. સમાસ
9. શબ્દસમૂહો માટે સામાસિક કે પારિભાષિક શબ્દો
10. સંધિ
11. છંદ